Remarks

In the present paper, Claims 1-38 are pending. Claims 30-38 have been withdrawn from consideration. Claims 1 and 21 have been amended. Support for the amendments can be found throughout the applicants application, including for example, page 8, starting at line 22; page 9 starting at line 4 and page 9 starting at line 25.

Allowable Subject Matter

The applicants would like to thank the Examiner for the early indication of allowable subject matter in dependent claims 8-13, 25, 27 and independent claim 29. However, the applicants have not rewritten claims 8-13, 25, 27 into independent form at this time because the applicants believe that the base claims, as amended herein, are patentable over the cited art as set out in greater detail below.

35 U.S.C. §102

Claims 1, 3 and 19 stand rejected under 35 U.S.C. §102(b) as being unpatentable in view of U.S. Pat. No. 6,441,915 to Imaizumi et al. (hereinafter, '*Imaizumi*'). According to the M.P.E.P. §706.02, in order to be anticipating under §102, the reference must teach every aspect of the claimed invention[1].

With reference to claim 1, as amended herein, *Imaizumi* fails to teach or suggest at least:

> …performing pixel shifts on select columns of said image data based upon a bow profile that characterizes process direction position errors of Pels written by a laser beam as it traverses generally in a scan direction to define adjusted image data
> … storing said adjusted image data to a second memory location and
> … deriving a laser signal from said adjusted image data in said second memory location such that said laser signal corresponds to said pixel shifted version of said image data that is pre-warped in said process direction in a manner corresponding to said bow profile.

Accordingly, claim 1, as amended herein, clarifies that the laser signal is derived from adjusted image data stored in a second memory location and that adjusted image data

[1] See also *Carella v. Starlight Archery and Pro Line Co.*, 804 F.2d 135, 138, 231 U.S.P.Q. 644, 646 (Fed. Cir. 1986).

corresponds to a pixel shifted version of associated image data that is pre-warped in the process direction in a manner corresponding to a bow profile.

To the contrary, as will be described in greater detail below, *Imaizumi* implements an imaging operation wherein the laser signal is derived from numerous processes that collectively manipulate, shift, encode and/or otherwise modify the image data, including the creation of print elements where no corresponding image data exists in the original image file, e.g., by compressing, expanding and interpolating image data, and by mixing, weighing, and scaling adjacent image data values both in the process and scan directions so that the laser signal *is not* a pixel shifted version of associated image data that is pre-warped in the process direction in a manner corresponding to a bow profile.

For relevant purposes herein, the invention in *Imaizumi* relates to a copy machine[2] having a print image controller 453[3] that compensates for image distortion and color shift introduced by the printing section of the device[4]. The print image controller 453 can be seen in Fig. 6 and is reproduced below.

The print image controller 453 includes a gradation reproducer, which converts 8-bit gradation levels of the CYMK image data received from the document scanner to 3-bit data based upon either simple quantization or multi-level error diffusion in accordance with a corresponding –LIMOS signal. Thus, the image data is initially compressed.

The output of the gradation reproducer 500 is coupled (through a frame memory 520) to a drawing position controller 510[5] and an image distortion controller 540, which together perform image correction to compensate for the types of image errors illustrated in Figs. 5A-

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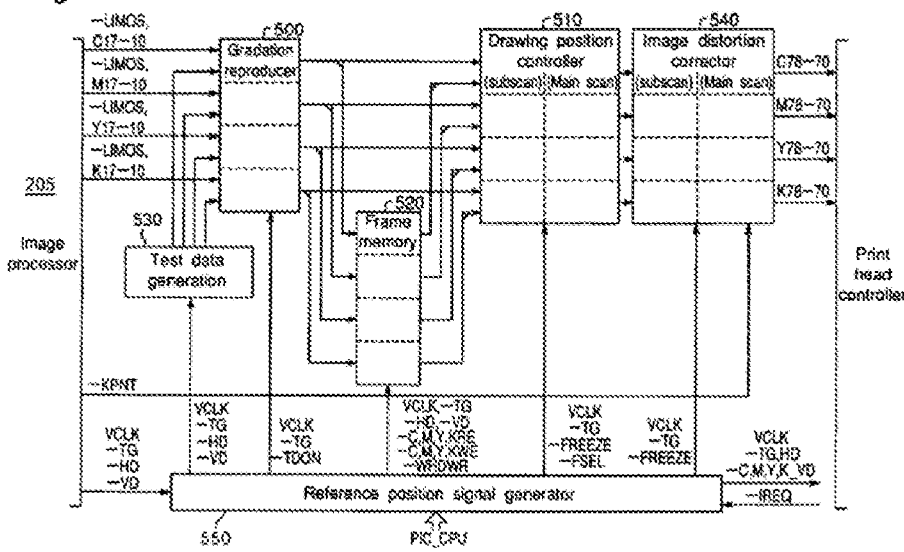
[2] See for example, Col. 3, lines 6-9; Figs. 3A, 3B.
[3] See also, for example, Fig. 3B.
[4] Figs. 5A-5F illustrate image distortion and color shift examples. See also, Col. 7, line 66 through Col. 8, line 25.
[5] The drawing position corrector 510 performs time delays of the CYMK image data to account for the corresponding physical spacing of the photoconductors. The drawing position controller 510 also controls the timing of the start position in the main scan direction in order to correct for a setting error of the printhead position in the main scan direction. See for example, Col. 11, lines 33-58.

5F. Generally, the CY and M image distortion is corrected to correspond to the image distortion in the black (K) color image plane[6].

Fig.6



The image distortion corrector 540 corrects main scan magnification, subscan bow and skew distortion "by means of the interpolation by a gradation level distribution"[7]. As will be seen in greater detail below, the "interpolation by a gradation level distribution" of the image data results in the *mixture of data* for each Pel position along a scan line based upon the values of source image data in multiple rows and multiple columns. This may result in the Image distortion corrector 540 *creating image data* that is not in the source image data. Thus, even if the data which is output from the image distortion corrector is stored in a second memory location, it is not a version of the image data having select columns that are pixel shifted in the process direction.

Moreover, there is no teaching or suggestion in *Imaizumi* of performing pixel shifts on select columns of image data based upon a bow profile … to define adjusted image data, storing the adjusted image data to a second memory location and deriving the laser signal from the adjusted image data in the second memory location.

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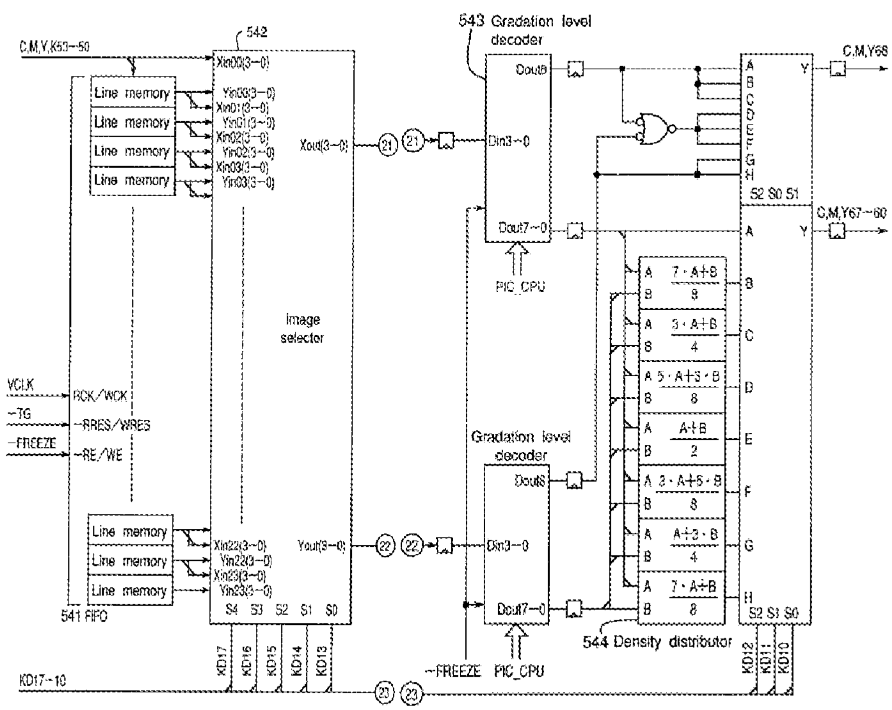
[6] See for example, Col. 8, lines 26-41.
[7] See Col. 8, lines 60-68.

The image distortion corrector 540 sequentially performs sub-scan (process) direction corrections and scan-direction corrections to the image data such that the output of the image corrector is a <u>*mixture*</u> of process and scan direction distortion corrections. Moreover, the corrections not only include shifting image data, but also scaling the image data, mixing the image data and creating new image data, e.g., by splitting a single image data value into two adjacent image data values in the process, scan or both directions.

There are two principle components to the image correction circuitry for sub-scan (process) direction correction, which is illustrated in Figs. 14A, 14B, reproduced below. With reference to Fig. 14A, the encoded 3-Bit CYMK image data and their corresponding gradation reproduction attribute signal –LIMOS are initially transferred into a FIFO buffer memory 541, which is capable of storing image data corresponding to a predetermined maximum width (process direction error).

Fig.14A *Fig.14B*



In the illustrated example, 24 lines of FIFO memory are provided. All of the FIFO buffers are simultaneously available to an Image Selector 542. Image select signals S4:S0 of the image selector 542 are used to select *two adjacent* lines from the available FIFOs,

designated as Xout(3-0) and Yout(3-0). For example, if the image select signals S4:S0 select the n^{th} FIFO buffer at output Xout(3-0), the $n+1^{th}$ FIFO buffer is simultaneously output on Yout(3-0)[8]. The interpolation signals KD_{17-13}, which control the image select signals S4:S0 of the Image selector 542, are derived from print errors determined by resist detecting sensors that are used in a separate calibration process to register CYM color planes to the black image plane.

Referring now to Fig. 14B, it can be seen that the Xout(3-0) data from the image selector 542 (illustrated in Fig. 14A) is input into a first gradation level decoder. Further, the Yout(3-0) data from the image selector 542 (illustrated in Fig. 14A) is input into a second gradation level decoder. Each gradation level decoder expands the first three bits of the corresponding encoded 3-bit data back out to 8-bits according to the gradation level expansion table, which is illustrated below. The gradation reproduction attribute signal –LIMOS is passed from the image selector 542 of Fig. 14A unchanged. Thus Dout7:0 corresponds to the encoded, then expanded image data, and Dout8 corresponds to the associated gradation reproduction attribute signal –LIMOS.

Input code (Din_{2-0})		Gradation level ($Dout_{7-0}$)
0	→	0
1	→	35
2	→	72
3	→	109
4	→	146
5	→	183
6	→	220
7	→	255

The output of the gradation level decoder corresponding to the two adjacent lines are input into a Density distributor 544, which performs *interpolation of density distribution for each 1/8 dot* by using the (expanded) data of the two adjacent lines Xout and Yout from the data selector 542. For example, assume that A is n^{th} line of expanded gradation level data and

[8] See for example, Col. 13, line 66 through Col. 14, line 26.

B is $(n+1)^{th}$ line of expanded gradation level data. Under this arrangement, the interpolation is as follows:

KD $_{12-10}$	**Y**
0	A
1	(7A + B)/8
2	(3A + B)/4
3	(5A + 3B)/8
4	(A + B)/2
5	(3A + 5B)/8
6	(A + 3B)/4
7	(A + 7B)/8

That is, the output C,Y,M 67-60[9] of the density distributor/density selector 544 (corresponding to the first part of image correction) is a "*mixture ratio*" or weighted sum of the inputs from *two adjacent lines* of data, where each line has been compressed to three bits and expanded back out to 8 bits based upon a preprogrammed gradation table[10].

Further, the image correction processor modifies the corresponding gradation reproduction attribute signal –LIMOS in one of three ways. Assume that the gradation reproduction attribute signal –LIMOS of nth line is A and the gradation reproduction attribute signal of (n+1)th line is B . The edge data A may be adopted, the edge data B may be adopted, or if either of A and B is an edge (-LIMOS="L"), then the output is adopted as an edge. The interpolation data KD12-10 determines which data is adopted.

FIG. 7 shows an example of the image distortion correction using the density distribution for the subscan direction for a hypothetical line.

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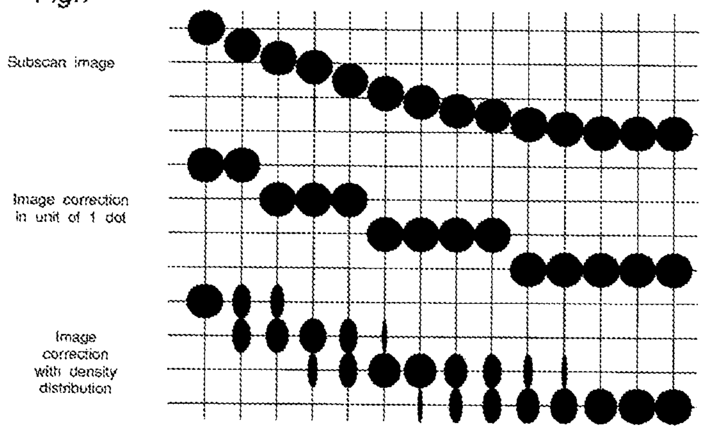
[9] Black is not processed by the density distributor because the CYM color planes are registered to black. Thus, black is uncorrected.

[10] See for example, Col. 14, starting at line 54 through Col. 15, line25.

Fig. 7

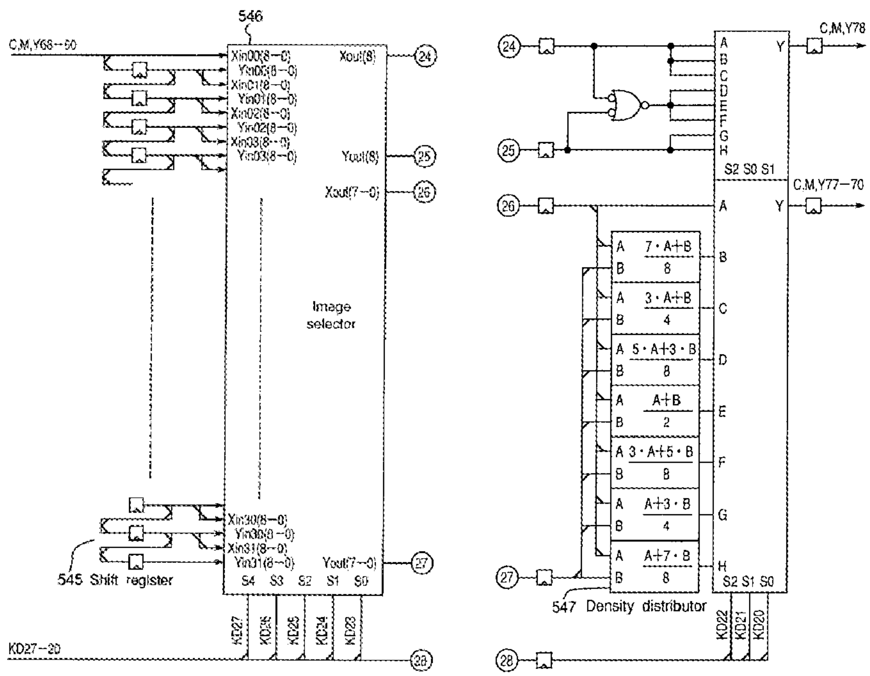


Notably, the output of the density distributor/selector 544 comprises a process direction correction defined by 8-bit gradation level image data that has first been *encoded* to 3-bits, subsequently *expanded* back out to 8 bits, and the "*mixed*" with the expanded gradation level image data of an adjacent scan line. In this regard and with reference to the image correction with density distribution shown in Fig. 7, it can be seen that the image data is modified by changing the value, e.g., via both the encoding from 8 bits to 3 bits and the subsequent expansion back to 8 bits, and by the mixture ratios that scale or weight certain positions. Moreover, the image correction processor further *creates* data that is not part of the original image data utilizing the mixture ratios as is evidenced by comparing the subscan image (top scan illustrated) and the corresponding scan correction with density distribution (bottom scan illustrated).

This intermediate output from the density distributor 544 flows into a processor for correcting the main scan image distortion as shown in Figs. 16A, 16B, which are reproduced below. Note that the output of the process direction correction C, M, Y, 68-60 flows into the scan direction correction processing. The process utilized to correct main scan distortion is similar to that utilized to correct for process direction distortion except that a shift register is used to generate continuous delay data along the main scan direction instead of the FIFO buffer (line memories). Otherwise, the relevant processing, e.g., the modification of the gradation reproduction attribute signal –LIMOS based upon adjacent image data is substantially the same as the discussion above for the process direction case. Moreover, the

output of the density distributor/selector 547 comprises a scan direction correction defined by 8-bit gradation level image data that is the "*mixed*" gradation level image data of *two adjacent dots*[11]. The output of the image distortion corrector CMYK(78-70) is then coupled to the printhead controller[12].

Fig.16A Fig.16B



The printhead controller includes a FIFO memory as seen in Fig. 18 and as identified by the Examiner. The FIFO serves as a temporary buffer to compensate for the differences between the image reader 200, which has a reference to one side of the platen[13] and the image forming section 300, which has a reference to the center of the transfer belt[14]. This is best seen in the timing diagram of Fig. 19 at the bottom, which illustrates the timing of signals C,Y,M,K 78-70 and C,Y,M,K 88-80.

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[11] See Col. 16, lines 8-12.

[12] See Figs. 16A, 16B and the corresponding text in the specification, Col. 15, line 66 through Col. 16 line 38.

[13] Registration to one side is implemented because each document to be scanned is aligned to the edge of the platen

[14] See Col. 17, lines 26-57.

However, this FIFO cannot reasonably be construed as a second memory location that stores adjusted image data as claimed. For example, the process in *Imaizumi*, manipulates the image data so as to create laser data where there is no corresponding image data as best seen in Fig. 7, by weighing or mixing adjacent columns and/or rows of image data. Moreover, the data that is queued in the FIFO shown in Fig. 18 represents data that has been converted from 8 bit down to 3 bit, processed, then expanded back out to 8 bit so that there is loss of information in the expansion. Then, the expanded data is mixed, distributed and/or processed in both the scan and process directions.

Moreover, even if a laser signal is derived from information in the FIFO, *Imaizumi* still fails to teach or suggest deriving a laser signal from said adjusted image data in said second memory location such that said laser signal corresponds to said pixel shifted version of said image data that is pre-warped in said process direction in a manner corresponding to said bow profile because the data in the FIFO is not a pixel shifted version of the image data.

In view of the amendments and clarifying comments herein, the applicants respectfully request that the Examiner withdraw the rejection of claim 1 and the claims that depend therefrom, including claims 3 and 19.

<u>35 U.S.C. §103</u>

Claim 2 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of U.S. Pat. No. 5,719,680 to Yoshida et al., (hereinafter, '*Yoshida*'). In view of the amendments and comments herein, the applicants respectfully request that the rejection to claim 2 be withdrawn as claim 2 depends from claim 1, which applicants believe is patentable as set forth in greater detail above.

Claims 4, 21, 23 and 26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of U.S. Pat. No. 5,585,536 to Pham et al. (hereinafter, '*Pham*'). Pham is discussed in greater detail in the applicants reply to the previous office action.

With reference to claim 4, the applicants respectfully request that the rejection be withdrawn as claim 4 depends from claim 1, which applicants believe is patentable as set forth in greater detail above.

According to the M.P.E.P. §706.02(j), to establish a *prima facie* case of obviousness, the prior art reference must teach or suggest all the claim limitations. It is the applicants' position that a *prima facie* case of obviousness has not been established for the claims as amended herein.

With respect to claim 21, as amended herein, *Imaizumi* in combination with *Pham* fails to teach or suggest at least:

> … a video processor operatively configured to derive a laser signal suitable for processing by said printhead by reading said adjusted image data from said second memory location, such that said laser signal corresponds to said pixel shifted version of said image data that is pre-warped in said process direction in a manner corresponding to said bow profile.

For relevant purposes herein, claim 21 contains apparatus limitations that are parallel to the method elements recited in claim 1. As such, the arguments set out with reference to claim 1 apply by analogy to the rejection of claim 21. The application of *Pham* to claim 21 has been previously discussed in the applicants reply to the previous Office action. In view of the amendments and clarifying comments herein, the applicants respectfully request that the Examiner withdraw the rejection of clam 21 and the claims that depend therefrom, including claims 23 and 26.

Claims 14-18, 20 and 28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of *Yoshida*. In view of the amendments and comments herein, the applicants respectfully request that the rejection to claims 14-18 and 20 be withdrawn as these claims depend from claim 1, which applicants believe is patentable as set forth in greater detail above. Similarly, claim 28 depends from claim 21, which applicants believe is patentable as set forth in greater detail above.

Claims 5-7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of *Pham* in further view of U.S. Pat. No. 6,445,404 to Kerby et al., (hereinafter, '*Kerby*').). In view of the amendments and comments herein, the applicants respectfully request that the rejection to claims 5-7 be withdrawn as these claims depend from claim 1, which applicants believe is patentable as set forth in greater detail above.

Claim 22 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of *Pham* in further view of U.S. Pat. No. 5,764,243 to Baldwin et al., (hereinafter '*Baldwin*'). In view of the amendments and comments herein, the applicants respectfully request that the rejection to claim 22 be withdrawn as this claim depends from claim 21, which applicants believe is patentable as set forth in greater detail above.

Claim 24 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Imaizumi* in view of *Pham* in further view of U.S. Pat. No. 6,819,351 to O'Hara et al., (hereinafter '*O'Hara*'). In view of the amendments and comments herein, the applicants respectfully request that the rejection to claim 24 be withdrawn as this claim depends from claim 21, which applicants believe is patentable as set forth in greater detail above.

Conclusion

For all of the above reasons, the applicants respectfully submit that the above claims recite allowable subject matter. The Examiner is encouraged to contact the undersigned to resolve efficiently any formal matters or to discuss any aspects of the application or of this response. Otherwise, early notification of allowable subject matter is respectfully solicited.

Respectfully submitted,
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